

Patent claims

1. Method for controlling at least one component of a technical plant by means of a PI controller that as control parameters has a control ratio ( $K_p$ ) and an integral-action time ( $T_n$ ),  
5 characterized by the following steps:
  - a) the integral-action time ( $T_n$ ) is defined,
  - b) an initial value ( $K_{p0}$ ) of the control ratio ( $K_p$ ) is defined,
  - c) at least one set value ( $S$ ) of a control quantity of the component  
10 is defined and
  - d) during operation of the technical plant, the actual value ( $I$ ) of the controlled variable is determined and the control ratio ( $K_p$ ) is changed relative to the time response of the actual value ( $I$ ) until the actual value ( $I$ ) of the control variable remains within  
15 a tolerance band ( $T_b$ ) relative to the set value ( $S$ ),
2. Method in accordance with Claim 1,  
characterized in that  
the integral-action time ( $T_n$ ) is determined from the system time  
20 constants ( $K_1$ ,  $K_2$ , ...,  $K_3$ ), particularly from the sum of the system time constants of the component to be controlled.
3. Method in accordance with Claim 1 or 2,  
characterized in that  
25 in step d) the control ratio ( $K_p$ ) is reduced if the time response of the actual value ( $I$ ) has a dwell time ( $T_{11}$ ) of less than the first defined time period ( $T_1$ ) during which the actual value ( $I$ ) has a value within the tolerance band.
- 30 4. Method in accordance with Claims 3,  
characterized in that

in step d) the control ratio ( $K_p$ ) is only reduced if in addition a first change rate ( $v_1$ ) of the actual value ( $I$ ) is greater than a second change rate ( $v_2$ ) of the set value ( $S_0$ ).

5     5.     Method according to one of Claims 1 to 4  
characterized in that  
in step d) the control ratio ( $K_p$ ) is increased, if the time response of  
the actual value ( $I$ ) has a rise time ( $T_2$ ) comprising the time period  
from the beginning of a change in the set value ( $S$ ) to reaching an  
10     instantaneous value of the actual value ( $I$ ) within the tolerance band,  
which is greater than a second defined time period ( $T_2$ ).

6.     Controller ( $R$ ) for controlling at least one component of a  
15     technical plant, that is designed as a PI controller having a control  
ratio ( $K_p$ ) and an integral-action time ( $T_n$ ) as control parameters  
characterized by

- a first controller input ( $E_1$ ) by means of which the controller  
       ( $R$ ) can be supplied with a defined value for the integral-action  
20     time ( $T_n$ ),
- a second controller input ( $E_2$ ) by means of which the controller  
       ( $R$ ) can be supplied with the control ratio ( $K_p$ ),
- a third controller input ( $E_3$ ) by means of which the controller  
       ( $R$ ) can be supplied with a set value ( $S$ ) of a control quantity of  
25     the component, and
- an adaption unit ( $A$ ) that during the operation of the technical  
       plant constantly applies the actual value ( $I$ ) of the control  
       variable ( $U$ ) and by means of which the control ratio ( $K_p$ ) can be  
       constantly changed relative to the time response of the actual  
30     value ( $I$ ), until the actual value ( $I$ ) of the control variable  
       remains within a tolerance band ( $T_b$ ) relative to the set value  
       ( $S$ ).

7. Controller in accordance with Claim 6,  
characterized in that

the integral-action time ( $T_n$ ) is determined from system time constants  
( $K_1$ ,  $K_2$ , ...,  $K_3$ ), in particular from the sum of the system time

5 constants of the component to be controlled.

8. Controller in accordance with Claim 6 or 7,  
characterized in that

10 the control ratio ( $K_p$ ) is reduced by the adaption unit (A) if the time  
response of the actual value (I) has a dwell time ( $T_{11}$ ), during which  
the actual value (I) comprises a value within the tolerance band, which  
is smaller than a first defined time period ( $T_1$ ).

8. Controller in accordance with one of claims 6 to 7,  
15 characterized in that

the control ratio ( $K_p$ ) is reduced by the adaption unit (A) if the time  
response of the actual value (I) has a dwell time ( $T_{11}$ ), during which  
the actual value (I) comprises a value within the tolerance band, which  
is smaller than a first defined time period ( $T_1$ ).

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9. Controller in accordance with Claim 8  
characterized in that

25 the control ratio ( $K_p$ ) is only then reduced by means of the adaption  
unit (A), if in addition a first change rate ( $v_1$ ) of the actual value  
(I) is larger than a second change rate ( $v_2$ ) of the set value (S).

10. Controller according to one of Claims 6 to 9  
characterized in that

30 the control ratio ( $K_p$ ) is increased by means of the adaption unit (A),  
if the time response of the actual value (I) has a rise time ( $T_{22}$ )  
comprising the time period from the beginning of a change in the set  
value (S) to reaching an instantaneous value of the actual value (I)  
within the tolerance band, which is greater than a second defined time  
period ( $T_2$ ).